

Rabbit Hemorrhagic Disease

Importance

Rabbit hemorrhagic disease (RHD) is an extremely contagious and often fatal disease of domestic and European rabbits. The mortality rate in a colony may be as high as 90%. The causative virus is very resistant to inactivation; it can persist in the environment, as well as in refrigerated or frozen carcasses, for months.

Etiology

Rabbit hemorrhagic disease results from infection by a calicivirus. Only a single serotype of the rabbit hemorrhagic disease virus (RHDV) has been identified.

A similar disease, known as European brown hare syndrome, is seen in continental Europe. This disease seems to affect only hares; the causative virus is closely related to RHDV.

Species affected

RHD affects only domestic and European rabbits (*Oryctolagus cuniculus*). Eastern cottontails, black-tailed jackrabbits, and volcano rabbits can be infected experimentally, but remain asymptomatic. European brown hares and varying hares do not seem to be affected by RHDV but are susceptible to European brown hare syndrome.

Geographic distribution

Rabbit hemorrhagic disease is endemic in China, Korea, most of continental Europe, Morocco, Cuba, Australia, and New Zealand. Rabbit hemorrhagic disease once existed in Mexico, but was eradicated by 1992. RHD was diagnosed in the US in 2000 (Iowa) and 2001 (Utah and New York). However, no massive outbreaks have occurred outside of small groups of affected rabbits.

Transmission

Rabbit hemorrhagic disease is transmitted by direct contact with infected animals and on fomites. Rabbits can acquire this disease through the oral, nasal, or conjunctival routes. Animals can shed RHDV in the urine or feces for as long as four weeks after infection. The virus may also be acquired by exposure to an infected carcass or hair from an infected animal. In addition, RHDV can be spread on contaminated food, bedding, and water. Mechanical transmission over short distances by biting insects, birds, rodents, wild animals, or vehicles may be possible.

Experimentally, rabbits can be infected by oral, nasal, subcutaneous, intramuscular, and intravenous inoculation

RHDV is very resistant to inactivation in the environment. The virus can survive for more than 9 months in blood stored at 4° C, or more than 3 months at room temperature

in dried organ homogenates. RHDV can also survive exposure to pH 3.0, heat of 50° C for an hour, or freeze-thaw cycles.

Incubation period

The incubation period is 1 to 3 days.

Clinical signs

All rabbits can become infected with RHDV, but clinical signs are usually seen only in animals that are more than 40-50 days old. Typically, infected rabbits develop a fever and die suddenly within 12 to 36 hours of its onset. In some cases, the only symptoms are terminal squeals followed rapidly by collapse and death. Dullness, anorexia, congestion of the palpebral conjunctiva, or prostration may also be seen. Occasionally, animals develop neurologic signs, including incoordination, excitement, opisthotonos, and paddling. Some rabbits turn and flip quickly in their cages; this can resemble convulsions or mania. Respiratory symptoms, including dyspnea and a terminal, blood-stained, frothy nasal discharge, are sometimes seen. Approximately 5% to 10% of the animals experience a more chronic course with severe jaundice, lethargy, and weight loss, and death within one to two weeks.

Post mortem lesions

Rabbits found dead of rabbit hemorrhagic fever are usually in good condition. The most consistent post-mortem lesions are hepatic necrosis and splenomegaly. The liver is usually pale, and has a fine reticular pattern of necrosis outlining each lobule. In cases with extensive necrosis, the liver may be diffusely pale. The spleen is usually black and thickened, with rounded edges. The kidneys may be very dark brown. Hemorrhages in the lungs, trachea, and thymus are common, and petechiae may be found on the serosal membranes or viscera. Infarcts may be seen in most organs. Catarrhal enteritis and congestion of the meninges have also been reported.

Morbidity and Mortality

Morbidity occurs in 30% to 80% of animals, and mortality ranges from 40% to 90%. Vaccines have been used in some countries where rabbit hemorrhagic disease is endemic. No treatment is available.

Diagnosis

Clinical

Rabbit hemorrhagic fever should be suspected when several animals die suddenly after a brief period of lethargy and fever. Hepatic necrosis and hemorrhages at necropsy support the diagnosis. This disease can be more difficult to diagnose when it occurs in an isolated rabbit.

Differential Diagnosis

Rabbit hemorrhagic disease should be differentiated from acute pasteurellosis, atypical myxomatosis, poisoning, heat exhaustion, and enterotoxemia due to *E. coli* or *Clostridium perfringens* Type E.

Laboratory Tests

The rabbit hemorrhagic disease virus has not been grown in cell cultures. However, viruses can be concentrated from the liver, blood, spleen, or other organs and identified by a hemagglutination test, a polymerase chain reaction (PCR) test, immunoblotting (Western blotting), negative-staining immunoelectron microscopy, immunostaining, or a sandwich enzyme-linked immunosorbent assay (ELISA).

Antibodies can also be detected in convalescent rabbits by hemagglutination inhibition, an indirect ELISA, or a competitive ELISA.

Where the disease is not endemic, inoculation into rabbits can confirm the first diagnosis. Animal inoculations can also help to identify cases that have not been definitively diagnosed by other tests.

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, contact the AVIC. These samples should only be sent under secure conditions, by authorized personnel, and to authorized laboratories to prevent the spread of disease.

Samples from suspect cases should include heparinized blood, serum, unfixed liver, fixed liver, spleen, kidney, lung, small intestine, and brain. The liver contains the highest titers of virus and is the best organ to submit for virus identification. Serum and spleen may also contain high levels of virus.

Recommended actions if rabbit hemorrhagic disease is suspected

Notification of authorities

Rabbit hemorrhagic disease must be reported to state or federal authorities immediately upon diagnosis or suspicion of the disease. Federal: Area Veterinarians in Charge (AVICS) http://www.aphis.usda.gov/vs/area_offices.htm
State vets: <http://www.aphis.usda.gov/vs/sregs/official.html>

Quarantine and Disinfection

RHDV can be inactivated by 10% sodium hydroxide or 1% to 1.4% formalin. Other suggested disinfectants include 2% One-stroke Environ® (Vestal Lab Inc., St. Louis, MO) and 0.5% sodium hypochlorite (10 percent household bleach). This virus resists degradation by ether or chloroform.

RHDV is extremely contagious and can be transmitted on fomites. Strict quarantine is very important.

Public health

There is no indication that the rabbit hemorrhagic disease virus infects humans.

For More Information

World Organization for Animal Health (OIE)
<http://www.oie.int>

OIE Manual of Standards

http://www.oie.int/eng/normes/mmanual/a_summry.htm

OIE International Animal Health Code

http://www.oie.int/eng/normes/mcode/A_summry.htm

USAHA Foreign Animal Diseases book

http://www.vet.uga.edu/vpp/gray_book/FAD/

References

“Rabbit Haemorrhagic Disease.” In *Manual of Standards for Diagnostic Tests and Vaccines*. Paris: World Organization for Animal Health, 2000, pp. 762-776.

“Viral Hemorrhagic Disease.” In *The Merck Veterinary Manual*, 8th ed. Edited by S.E. Aiello and A. Mays. Whitehouse Station, NJ: Merck and Co., 1998, pp. 1398-9.

Gregg, D.A. “Viral Hemorrhagic Disease of Rabbits.” In *Foreign Animal Diseases*. Richmond, VA: United States Animal Health Association, 1998, pp. 424-431.

Rabbit Calicivirus Disease, Iowa, April 2000 Impact Worksheet. Center for Emerging Issues. <<http://www.aphis.usda.gov:80/vs/ceah/cei/rabbitcal.htm>>.